# anticipation

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These papers are circulated for the information of participants in the ecumenical inquiry on "The Future of Man and Society in a World of Science-Based Technology". Comments are welcome.

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Introductory Note: Next Steps in the Ecumenical Study of Technology and the Future of Man and Society

This bulletin serves a double purpose: to bring together literature pertinent to the ecumenical discussion of technology and the future of man and society, and to report on the results of the World Council's own study programme. The last four numbers have contained the papers and presentations to the Exploratory Conference on Technology and the Future of Man and Society (Geneva 1970), and with this number we begin publication of materials relating to the next stage in the inquiry.

## Follow-up of the Exploratory Conference of Geneva 1970

The Exploratory Conference of 1970 was convened to make a preliminary inquiry on the Christian concern for Technology and the Future, to secure the advice of a representative group of scientists and technologists concerning the impact of science and technology on man and society, and to test their interest in ecumenical dialogue with theologians and others on the interpretation and evaluation of this impact.

The Conference was surprisingly successful in accomplishing these objectives despite three problems: the difficulty of many traditional ecumenical social thinkers in recognising a determinate role of science and technology for the future of man and society, and their fear that the concern for technology will lead to a weakening of the resolve for social justice; the different expectations entertained by scientists and technologists on the one hand and theologians and social thinkers on the other regarding the role of theology in devising answers for the moral problems of modern technological society; and the uncertainty evidenced by the conference when it tried to set out the precise points or priorities for the Church as it takes up the problems of technological change. David Gill, in his summary of the conference debate, From Here To Where? has outlined very clearly the substance of these and other issues raised at the conference, and readers are referred to it for detailed information on the conclusions of the conference.[1]

The fear of many ecumenical social thinkers that the concern for science and technology would diminish or weaken the traditional ecumenical concern for social justice has not been substantiated. Indeed, it becomes clearer that without this new dimension ecumenical social thought and action are incomplete and that the churches have delayed too long in taking up the ethical and theological problems posed for modern society by science and technology. One of the discoveries of the conference was the readiness of scientists and technologists to engage in a discussion of their responsibilities for the future

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[1] Published by the World Council of Churches, December 1970, 111 pages

of man. They have become a powerful force in the shaping and structuring of modern society, and are eager to discuss with men of other disciplines the issues which this raises and the prospects for the future. Indeed, if the Exploratory Conference revealed anything, it was that the theologians and social thinkers are less well prepared than the scientists and technologists to take a penetrating new look at the pattern of modern society and the implications of technological and scientific revolution.

Plans for the Future

In the light of the conference and the debate which it provoked, the officers and staff of the Department on Church and Society developed a plan for the inquiry during the next three years. This was submitted to the Central Committee of the World Council of Churches' meeting in Addis Ababa, January 10-21, 1971, which gave its approval to the plans and appended comments of its own. A copy of the Central Committee's action is enclosed with this issue of Anticipation.

Readers will see that this plan calls for concentration on three principal concerns:

A. Science and the Quality of Life - with special emphasis on the implications of the discoveries of the biological and ecological sciences, as these might influence thinking about the quality of human life;

B. Political and Economic Choices in a Technological Age - with reference to the further expansion and the right use of the new technology, planning for the future and the renewal of socio-economic systems and structures;

C. Images of the Future - with reference to the new vision which comes from cultural and artistic symbolism or from faith itself about the possibility of a new creation.

An enlarged meeting of the Working Committee on Church and Society, to be held in Nemi, Italy, June 20-26, 1971, will review and refine the way the issues are being formulated and determine a systematic programme of work for the next three years.

International, Regional and Local Participation

The choice of these issues for common ecumenical study is based on the advice of people familiar with problems of technology and society in different areas of the world, and is offered as a general framework for churches wishing to share in this inquiry. Within the three main concerns there is a large possibility of selection and choice and indeed the main problem of the coming years will be to find a narrower focus. Interested groups are encouraged to select or focus on those points which are most pertinent to their concern, or

to suggest other relevant points omitted in the present outline.

One important objective of the study is to see the problem of science and technology in an ecumenical perspective; to challenge the parochialism of national or regional concerns; and to see the interdependent nature of the decisions that must be taken on issues related to science, technology and society. Comments, suggestions and proposals on these plans are welcome and may be addressed to the W.C.C., Department on Church and Society, Geneva, Switzerland.

Articles in this Issue

The articles in this issue of Anticipation focus principally on the economic and political choices in a technological era. We are pleased to reprint the article by Prof. Kenneth Boulding on "The Economics of the Coming Spaceship Earth", originally published in 1966, which proved to be one of the pioneer statements of the economic and political choices facing mankind in a constantly expanding and increasingly interdependent technological world-society. Prof. Boulding has permitted republication of his article and has brought it up to date by adding a commentary in the light of the discussion it has provoked. A well-known American economist who participated in the 1966 World Conference on Church and Society Professor Boulding is now on the staff of the Institute of Behavioural Science, University of Colorado, U.S.A.

The essay by Denys Munby is a portion of his contribution to the symposium Humane Gesellschaft - Beiträge zu ihrer sozialen Gestaltung (Zwingli-Verlag 1970), edited by Prof. Arthur Rich (Zurich) and Prof. Trutz Rendtorff (Munich), in honour of Prof. H.D. Wendland, the outstanding ecumenical theologian and social thinker of the University of Münster who retired last year. The original essay by Mr. Munby was entitled Faith and Facts. He is reader in transportation Economics, Nuffield College, Oxford and a contributor since 1951 to ecumenical social ethics and a member of the Working Committee on Church and Society.

The third contribution is excerpted from a Commencement Address at the Catholic University, Washington, D.C. (1970), by Dr. William J. McGill, President of Columbia University, New York City. We are grateful to Dr. McGill, a Roman Catholic layman, for permission to publish this slightly abbreviated version of his address.

P.A.

# THE ECONOMICS OF THE COMING SPACESHIP EARTH

Kenneth E. Boulding

We are now in the middle of a long process of transition in the nature of the image which man has of himself and his environment. Primitive men, and to a large extent also men of the early civilisations, imagined themselves to be living on a virtually illimitable plane. There was almost always somewhere beyond the known limits of human habitation, and over a very large part of the time that man has been on earth, there has been something like a frontier. That is, there was always some place else to go when things got too difficult, either by reason of the deterioration of the natural environment or a deterioration of the social structure in places where people happened to live. The image of the frontier is probably one of the oldest images of mankind, and it is not surprising that we find it hard to get rid of.

Gradually, however, man has been accustoming himself to the notion of the spherical earth and a closed sphere of human activity. A few unusual spirits among the ancient Greeks perceived that the earth was a sphere. It was only with the circumnavigations and the geographical explorations of the fifteenth and sixteenth centuries, however, that the fact that the earth was a sphere became at all widely known and accepted. Even in the nineteenth century, the commonest map was Mercator's projection, which visualises the earth as an illimitable cylinder, essentially a plane wrapped around the globe, and it was not until the Second World War and the development of the air age that the global nature of the planet really entered the popular imagination. Even now we are very far from having made the moral, political, and psychological adjustments which are implied in this transition from the illimitable plane to the closed sphere.

Economists in particular, for the most part, have failed to come to grips with the ultimate consequences of the transition from the open to the closed earth. One hesitates to use the terms "open" and "closed" in this connection, as they have been used with so many different shades of meaning. Nevertheless, it is hard to find equivalents. The open system, indeed, has some similarities to the open system of von Bertalanffy,[1] in that it implies that some kind of a structure is maintained in the midst of a throughput from inputs to outputs. In a closed system, the outputs of all parts of the system are linked to the inputs of other parts. There are no inputs from outside and no outputs to the outside; indeed, there is no outside at all. Closed systems, in fact, are very rare in human experience, in fact almost by definition unknowable, for if there are genuinely closed systems around us, we have no way of getting information into them or out of them; and hence if they are really closed, we would be quite unaware of their existence. We can only find out about a closed system if we participate in it. Some isolated primitive societies may have approximated to this, but even these had to take inputs from the environment and give outputs to it. All living organisms, including man himself, are open systems. They have to receive inputs in the shape of air, food, water, and give off outputs in the form of effluvia and excrement. Deprivation of

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1 Ludwig von Bertalanffy, Problems of Life (New York: John Wiley and Sons, 1952)

Input of air, even for a few minutes, is fatal. Deprivation of the ability to obtain any input or to dispose of any output is fatal in a relatively short time. All human societies have likewise been open systems. They receive inputs from the earth, the atmosphere, and the waters, and they give outputs into these reservoirs; they also produce inputs internally in the shape of babies and outputs in the shape of corpses. Given a capacity to draw upon inputs and to get rid of outputs, an open system of this kind can persist indefinitely.

There are some systems - such as the biological phenotype, for instance the human body - which cannot maintain themselves indefinitely by inputs and outputs because of the phenomenon of aging. This process is very little understood. It occurs, evidently, because there are some outputs which cannot be replaced by any know input. There is not the same necessity for aging in organisations and in societies, although an analogous phenomenon may take place. The structure and composition of an organisation or society, however, can be maintained by inputs of fresh personnel from birth and education as the existing personnel ages and eventually dies. Here we have an interesting example of a system which seems to maintain itself by the self-generation of inputs, and in this sense is moving towards closure. The input of people (that is, babies) is also an output of people (that is, parents).

Systems may be open or closed in respect to a number of classes of inputs and outputs. Three important classes are matter, energy, and information. The present world economy is open in regard to all three. We can think of the world economy or "econosphere" as a subset of the "world set", which is the set of all objects of possible discourse in the world. We then think of the state of the econosphere at any one moment as being the total capital stock, that is, the set of all objects, people, organisations, and so on, which are interesting from the point of view of the system of exchange. This total stock of capital is clearly an open system in the sense that it has inputs and outputs, inputs being production which adds to the capital stock, outputs being consumption which subtracts from it. From a material point of view, we see objects passing from the noneconomic into the economic set in the process of production, and we similarly see products passing out of the economic set as their value becomes zero. Thus we see the econosphere as a material process involving the discovery and mining of fossil fuels, ores, etc., and at the other end a process by which the effluents of the system are passed out into noneconomic reservoirs - for instance, the atmosphere and the oceans - which are not appropriated and do not enter into the exchange system.

From the point of view of the energy system, the econosphere involves inputs of available energy in the form, say, of water power, fossil fuels, or sunlight, which are necessary in order to create the material throughput and to move matter from the noneconomic set into the economic set or even out of it again; and energy itself is given off by the system in a less available form, mostly in the form of heat. These inputs of available energy must come either from the sun (the energy supplied by other stars being assumed to be negligible) or it may come from the earth itself, either through its internal heat or through its energy of rotation or other motions, which generate, for instance, the energy of the tides. Agriculture, a few solar machines, and water power use the current available energy income. In advanced societies this is supplemented very extensively by the use of fossil fuels, which represent

as it were a capital stock of stored-up sunshine. Because of this capital stock of energy, we have been able to maintain an energy input into the system, particularly over the last two centuries, much larger than we would have been able to do with existing techniques if we had had to rely on the current input of available energy from the sun or the earth itself. This supplementary input, however, is by its very nature exhaustible.

The inputs and outputs of information are more subtle and harder to trace, but also represent an open system, related to, but not wholly dependent on, the transformations of matter and energy. By far the larger amount of information and knowledge is self-generated by the human society, though a certain amount of information comes into the sociosphere in the form of light from the universe outside. The information that comes from the universe has certainly affected man's image of himself and of his environment, as we can easily visualise if we suppose that we lived on a planet with a total cloud-cover that kept out all information from the exterior universe. It is only in very recent times, of course, that the information coming in from the universe has been captured and coded into the form of a complex image of what the universe is like outside the earth; but even in primitive times, man's perception of the heavenly bodies has always profoundly affected his image of earth and of himself. It is the information generated within the planet, however, and particularly that generated by man himself, which forms by far the larger part of the information system. We can think of the stock of knowledge, or as Teilhard de Chardin called it, the "noosphere", and consider this as an open system, losing knowledge through aging and death and gaining it through birth and education and the ordinary experience of life.

From the human point of view, knowledge or information is by far the most important of the three systems. Matter only acquires significance and only enters the sociosphere or the econosphere insofar as it becomes an object of human knowledge. We can think of capital, indeed, as frozen knowledge or knowledge imposed on the material world in the form of improbable arrangements. A machine, for instance, originated in the mind of man, and both its construction and its use involve information processes imposed on the material world by man himself. The cumulation of knowledge, that is, the excess of its production over its consumption, is the key to human development of all kinds, especially to economic development. We can see this pre-eminence of knowledge very clearly in the experiences of countries where the material capital has been destroyed by a war, as in Japan and Germany. The knowledge of the people was not destroyed, and it did not take long, therefore, certainly not more than ten years, for most of the material capital to be re-established again. In a country such as Indonesia, however, where the knowledge did not exist, the material capital did not come into being either. By "knowledge" here I mean, of course, the whole cognitive structure, which includes valuations and motivations as well as images of the factual world.

The concept of entropy, used in a somewhat loose sense, can be applied to all three of these open systems. In the case of material systems, we can distinguish between entropic processes, which take concentrated materials and diffuse them through the oceans or over the earth's surface or into the atmosphere, and anti-entropic processes, which take diffuse materials and concentrate them. Material entropy can be taken as a measure of the uniformity of the distribution of elements and, more uncertainly, compounds and other

structures on the earth's surface. There is, fortunately, no law of increasing material entropy, as there is in the corresponding case of energy, as it is quite possible to concentrate diffused materials if energy inputs are allowed. Thus the processes for fixation of nitrogen from the air, processes for the extraction of magnesium or other elements from the sea, and processes for the desalinisation of sea water are anti-entropic in the material sense, though the reduction of material entropy has to be paid for by inputs of energy and also inputs of information, or at least a stock of information in the system. In regard to matter, therefore, a closed system is conceivable, that is, a system in which there is neither increase nor decrease in material entropy. In such a system all outputs from consumption would constantly be recycled to become inputs for production, as for instance, nitrogen in the nitrogen cycle of the natural ecosystem.

In regard to the energy system there is, unfortunately, no escape from the grim Second Law of Thermodynamics; and if there were no energy inputs into the earth, any evolutionary or developmental process would be impossible. The large energy inputs which we have obtained from fossil fuels are strictly temporary. Even the most optimistic predictions would expect the easily available supply of fossil fuels to be exhausted in a mere matter of centuries at present rates of use. If the rest of the world were to rise to American standards of power consumption, and still more if world population continues to increase, the exhaustion of fossil fuels would be even more rapid. The development of nuclear energy has improved this picture, but has not fundamentally altered it, at least in present technologies, for fissionable material is still relatively scarce. If we should achieve the economic use of energy through fusion, of course, a much larger source of energy materials would be available, which would expand the time horizons of supplementary energy input into an open social system by perhaps tens to hundreds of thousands of years. Failing this, however, the time is not very far distant, historically speaking, when man will once more have to retreat to his current energy input from the sun, even though this could be used much more effectively than in the past with increased knowledge. Up to now, certainly, we have not got very far with the technology of using current solar energy, but the possibility of substantial improvements in the future is certainly high. It may be, indeed, that the biological revolution which is just beginning will produce a solution to this problem, as we develop artificial organisms which are capable of much more efficient transformation of solar energy into easily available forms than any that we now have. As Richard Meier has suggested, we may run our machines in the future with methane-producing algae.[2]

The question of whether there is anything corresponding to entropy in the information system is a puzzling one, though of great interest. There are certainly many examples of social systems and cultures which have lost knowledge, especially in transition from one generation to the next, and in which the culture has therefore degenerated. One only has to look at the folk culture of Appalachian migrants to American cities to see a culture which started out as a fairly rich European folk culture in Elizabethan times and which seems to have lost both skills, adaptability, folk tales, songs and almost everything that goes up to make richness and complexity in a culture,

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[2] Richard L. Meier, Science and Economic Development (New York: John Wiley and Sons, 1956)

in the course of about ten generations. The American Indians on reservations provide another example of such degradation of the information and knowledge system. On the other hand, over a great part of human history, the growth of knowledge in the earth as a whole seems to have been almost continuous, even though there have been times of relatively slow growth and times of rapid growth. As it is knowledge of certain kinds that produces the growth of knowledge in general, we have here a very subtle and complicated system, and it is hard to put one's finger on the particular elements in a culture which make knowledge grow more or less rapidly, or even which make it decline. One of the great puzzles in this connection, for instance, is why the take-off into science, which represents an "acceleration", or an increase in the rate of growth of knowledge in European society in the sixteenth century, did not take place in China, which at that time (about 1600) was unquestionably ahead of Europe, and one would think even more ready for the breakthrough. This is perhaps the most crucial question in the theory of social development, yet we must confess that it is very little understood. Perhaps the most significant factor in this connection is the existence of "slack" in the culture, which permits a divergence from established patterns and activity which is not merely devoted to reproducing the existing society but is devoted to changing it. China was perhaps too well-organised and had too little slack in its society to produce the kind of acceleration which we find in the somewhat poorer and less well-organised but more diverse societies of Europe.

The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past. For the sake of picturesqueness, I am tempted to call the open economy the "cowboy economy", the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behaviour, which is characteristic of open societies. The closed economy of the future might similarly be called the "spaceman" economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy. The difference between the two types of economy becomes most apparent in the attitude towards consumption. In the cowboy economy, consumption is regarded as a good thing and production likewise; and the success of the economy is measured by the amount of the throughput from the "factors of production", a part of which, at any rate, is extracted from the reservoirs of raw materials and noneconomic objects, and another part of which is output into the reservoirs of pollution. If there are infinite reservoirs from which material can be obtained and into which effluvia can be deposited, then the throughput is at least a plausible measure of the success of the economy. The gross national product is a rough measure of this total throughput. It should be possible, however, to distinguish that part of the GNP which is derived from exhaustible and that which is derived from reproducible resources, as well as that part of consumption which represents effluvia and that which represents input into the productive system again. Nobody, as far as I know, has ever attempted to break down the GNP in this way, although it would be an interesting and extremely important exercise, which is unfortunately beyond the scope of this paper.

By contrast, in the spaceman economy, throughput is by no means a desideratum, and is indeed to be regarded as something to be minimised rather than maximised. The essential measure of the success of the economy is not production and consumption at all, but the nature, extent, quality, and complexity of the total capital stock, including in this the state of the human bodies and minds included in the system. In the spaceman economy, what we are primarily concerned with is stock maintenance, and any technological change which results in the maintenance of a given total stock with a lessened throughput (that is, less production and consumption) is clearly a gain. This idea that both production and consumption are bad things rather than good things is very strange to economists, who have been obsessed with the income-flow concepts to the exclusion, almost, of capital-stock concepts.

There are actually some very tricky and unsolved problems involved in the questions as to whether human welfare or well-being is to be regarded as a stock or a flow. Something of both these elements seems actually to be involved in it, and as far as I know there have been practically no studies directed towards identifying these two dimensions of human satisfaction. Is it, for instance, eating that is a good thing, or is it being well fed? Does economic welfare involve having nice clothes, fine houses, good equipment, and so on, or is it to be measured by the depreciation and the wearing out of these things? I am inclined myself to regard the stock concept as most fundamental, that is, to think of being well fed as more important than eating, and to think even of so-called services as essentially involving the restoration of a depleting psychic capital. Thus I have argued that we go to a concert in order to restore a psychic condition which might be called "just having gone to a concert", which, once established, tends to depreciate. When it depreciates beyond a certain point, we go to another concert in order to restore it. If it depreciates rapidly, we go to a lot of concerts; if it depreciates slowly, we go to few. On this view, similarly, we eat primarily to restore bodily homeostasis, that is, to maintain a condition of being well fed, and so on. On this view, there is nothing desirable in consumption at all. The less consumption we can maintain a given state with, the better off we are. If we had clothes that did not wear out, houses that did not depreciate, and even if we could maintain our bodily condition without eating, we would clearly be much better off.

It is this last consideration, perhaps, which makes one pause. Would we, for instance, really want an operation that would enable us to restore all our bodily tissues by intravenous feeding while we slept? Is there not, that is to say, a certain virtue in throughput itself, in activity itself, in production and consumption itself, in raising food and in eating it? It would certainly be rash to exclude this possibility. Further interesting problems are raised by the demand for variety. We certainly do not want a constant state to be maintained; we want fluctuations in the state. Otherwise there would be no demand for variety in food, for variety in scene, as in travel, for variety in social contact, and so on. The demand for variety can, of course, be costly, and sometimes it seems to be too costly to be tolerated or at least legitimated, as in the case of marital partners, where the maintenance of a homeostatic state in the family is usually regarded as much more desirable than the variety and excessive throughput of the libertine. There are problems here which the economics profession has neglected with astonishing single-mindedness. My own attempts to call attention to some of them, for instance,

in two articles,[3] as far as I can judge, produced no response whatever; and economists continue to think and act as if production, consumption, throughput, and the GNP were the sufficient and adequate measure of economic success.

It may be said, of course, why worry about all this when the spaceman economy is still a good way off (at least beyond the lifetimes of any now living), so let us eat, drink, spend, extract and pollute, and be as merry as we can, and let posterity worry about the spaceship earth. It is always a little hard to find a convincing answer to the man who says, "What has posterity ever done for me?" and the conservationist has always had to fall back on rather vague ethical principles postulating identity of the individual with some human community or society which extends not only back into the past but forward into the future. Unless the individual identifies with some community of this kind, conservation is obviously "irrational". Why should we not maximise the welfare of this generation at the cost of posterity? "Après nous, le déluge" has been the motto of not insignificant numbers of human societies. The only answer to this, as far as I can see, is to point out that the welfare of the individual depends on the extent to which he can identify himself with others, and that the most satisfactory individual identity is that which identifies not only with a community in space but also with a community extending over time from the past into the future. If this kind of identity is recognised as desirable, then posterity has a voice, even if it does not have a vote; and in a sense, if its voice can influence votes, it has votes too. This whole problem is linked up with the much larger one of the determinants of the morale, legitimacy, and "nerve" of a society, and there is a great deal of historical evidence to suggest that a society which loses its identity with posterity and which loses its positive image of the future loses also its capacity to deal with present problems, and soon falls apart.[4]

Even if we concede that posterity is relevant to our present problems, we still face the question of time-discounting and the closely related question of uncertainty-discounting. It is a well-known phenomenon that individuals discount the future, even in their own lives. The very existence of a positive rate of interest may be taken as at least strong supporting evidence of this hypothesis. If we discount our own future, it is certainly not unreasonable to discount posterity's future even more, even if we do give posterity a vote. If we discount this at 5 per cent per annum, posterity's vote of dollar halves every fourteen years as we look into the future, and after even a mere hundred years it is pretty small - only about 1½ cents on the dollar. If we add another 5 per cent for uncertainty, even the vote of our grandchildren reduces almost to insignificance. We can argue, of course, that the ethical thing to do is not to discount the future at all, that time-discounting is mainly the result of myopia and perspective, and hence is an illusion which the moral man should not tolerate. It is a very popular illusion, however, and one that must certainly be taken into consideration in the formulation of policies. It explains, perhaps, why conservationist policies almost have to be sold under some other excuse which seems more urgent, and why, indeed,

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[3] K. E. Boulding, "The Consumption Concept in Economic Theory", American Economic Review, 35:2 (May 1945), pp. 1-14; and "Income or Welfare?", Review of Economic Studies, 17 (1949-50), pp. 77-86

[4] Fred L. Polak, The Image of the Future, Vols. I and II, translated by Elise Boulding (New York: Sythoff, Leyden and Oceana, 1969)

necessities which are visualised as urgent, such as defense, always seem to hold priority over those which involve the future.

All these considerations add some credence to the point of view which says that we should not worry about the spaceman economy at all, and that we should just go on increasing the GNP and indeed the gross world product, or GWP, in the expectation that the problems of the future can be left to the future, that when scarcities arise, whether this is of raw materials or of pollutable reservoirs, the needs of the then present will determine the solutions of the then present, and there is no use giving ourselves ulcers by worrying about problems that we really do not have to solve. There is even high ethical authority for this point of view in the New Testament, which advocates that we should take no thought for tomorrow and let the dead bury their dead. There has always been something rather refreshing in the view that we should live like the birds, and perhaps posterity is for the birds in more senses than one; so perhaps we should all call it a day and go out and pollute something cheerfully. As an old taker of thought for the morrow, however, I cannot quite accept this solution; and I would argue, furthermore, that tomorrow is not only very close, but in many respects it is already here. The shadow of the future spaceship, indeed, is already falling over our spendthrift merriment. Oddly enough , it seems to be in pollution rather than in exhaustion that the problem is first becoming salient. Los Angeles has run out of air, Lake Erie has become a cesspool, the oceans are getting full of lead and DDT, and the atmosphere may become man's major problem in another generation, at the rate at which we are filling it up with gunk. It is, of course, true that at least on a microscale, things have been worse at times in the past. The cities of today, with all their foul air and polluted waterways, are probably not as bad as the filthy cities of the pretechnical age. Nevertheless, that fouling of the nest which has been typical of man's acitivity in the past on a local scale now seems to be extending to the whole world society; and one certainly cannot view with equanimity the present rate of pollution of any of the natural reservoirs, whether the atmosphere, the lakes, or even the oceans.

I would argue strongly also that our obsession with production and consumption to the exclusion of the "state" aspects of human welfare distorts the process of technological change in a most undesirable way. We are all familiar, of course, with the wastes involved in planned obsolescence, in competitive advertising, and in poor quality of consumer goods. These problems may not be so important as the "view with alarm" school indicates, and indeed the evidence at many points is conflicting. New materials especially seem to edge towards the side of improved durability, such as, for instance, neolite soles for footwear, nylon socks, wash and wear shirts, and so on. The case of household equipment and automobiles is a little less clear. Housing and building construction generally almost certainly has declined in durability since the Middle Ages, but this decline also reflects a change in tastes towards flexibility and fashion and a need for novelty, so that it is not easy to assess. What is clear is that no serious attempt has been made to assess the impact over the whole of economic life of changes in durability, that is, in the ratio of capital in the widest possible sense to income. I suspect that we have underestimated, even in our spendthrift society, the gains from increased durability, and that this might very well be one of the places where the price system needs correction through government-sponsored research and development. The problems which the spaceship earth is going to present,

therefore, are not all in the future by any means, and a strong case can be made for paying much more attention to them in the present than we now do.

It may be complained that the considerations I have been putting forth relate only to the very long run, and they do not much concern our immediate problems. There may be some justice in this criticism, and my main excuse is that other writers have dealt adequately with the more immediate problems of deterioration in the quality of the environment. It is true, for instance, that many of the immediate problems of pollution of the atmosphere or of bodies of water arise because of the failure of the price system, and many of them could be solved by corrective taxation. If people had to pay the losses due to the nuisances which they create, a good deal more resources would go into the prevention of nuisances. These arguments involving external economies and diseconomies are familiar to economists, and there is no need to recapitulate them. The law of torts is quite inadequate to provide for the correction of the price system which is required, simply because where damages are widespread and their incidence on any particular person is small, the ordinary remedies of the civil law are quite inadequate and inappropriate. There needs, therefore, to be special legislation to cover these cases, and though such legislation seems hard to get in practice, mainly because of the widespread and small personal incidence of the injuries, the technical problems involved are not insuperable. If we were to adopt in principle a law for tax penalties for social damages, with an apparatus for making assessments under it, a very large proportion of current pollution and deterioration of the environment would be prevented. There are tricky problems of equity involved, particularly where old established nuisances create a kind of "right by purchase" to perpetuate themselves, but these are problems again which a few rather arbitrary decisions can bring to some kind of solution.

The problems which I have been raising in this paper are of larger scale and perhaps much harder to solve than the more practical and immediate problems of the above paragraph. Our success in dealing with the larger problems, however, is not unrelated to the development of skill in the solution of the more immediate and perhaps less difficult problems. One can hope, therefore, that as a succession of mounting crises, especially in pollution, arouse public opinion and mobilise support for the solution of the immediate problems, a learning process will be set in motion which will eventually lead to an appreciation of and perhaps solutions for the larger ones. My neglect of the immediate problems, therefore, is in no way intended to deny their importance, for unless we at least make a beginning on a process for solving the immediate problems we will not have much chance of solving the larger ones. On the other hand, it may also be true that a long-run vision, as it were, of the deep crisis which faces mankind may predispose people to taking more interest in the immediate problems and to devote more effort for their solution. This may sound like a rather modest optimism, but perhaps a modest optimism is better than no optimism at all.

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Additional Comment on March 30, 1971

## THE ECONOMICS OF THE COMING SPACE-SHIP EARTH

Kenneth E. Boulding

In the five years that have elapsed since the publication of this article, an enormous amount of interest in this and related subjects has been developed and there has been a real change in the awareness, especially of young people and college students, of the significance of these problems. This arousal of interest is all to the good. The whole problem of environmental deterioration, however, arises precisely because good things always come jointly produced with bad things. Thus, even the great ecological arousal, good as it is, produces certain pollution effects of its own in the intellectual sphere, because the kind of rhetoric which produces arousal is not always the rhetoric which produces truth.

I think perhaps the greatest danger in current thinking is exaggeration of man's impact on the total system of the earth, which up to now at any rate is really quite small, and may be overestimated because it is highly concentrated in centres of population. These exaggerations may be pardonable from the point of view of the rhetoric of arousal, but they are dangerous in that they may undermine confidence in the validity of the scientific community, particularly when distinguished scientists in one field go beyond their particular technical competence and set up as authorities in other fields.

The truth is that we really know very little about the impact of human activities on the earth as a total system. We do not even really know, for instance, whether, as a result of man's activity, the earth is warming up or cooling down. People sometimes have the illusion that the physical and the biological sciences have all the answers to these problems, and that these only require social implementation. Nothing could be further from the truth. A great deal of the difficulty lies in the backwardness of the physical and biological sciences, when it comes to the problem of the earth as a total system. The result is that it is very hard to evaluate the consequences of human activity when we do not know what these consequences are, and that at least humility is required when we have to have so much to be humble about. On the other hand, there is also a lot to be said for those who argue that in the face of ignorance it is better to be on the safe side. It is better, therefore, to overestimate the effects of human activity rather than to underestimate them.

A serious problem in the discussions has been the confusion between the kind of long-run problem which is outlined in my 1966 article and the short-run problems of improving a particular environment in particular places. In many instances, the short-run problems are not too difficult to solve. When I recall the Liverpool and London of my childhood, or even Pittsburgh as I saw it as a young man, it is hard for me not to be a little optimistic, for I have lived through an epoch of spectacular improvement in particular environments in many places.

One of the odd things about the ecological excitement of the last five years indeed is that it has not been the result of any spectacular ecological disaster, but has been the result of a mainly intellectual process. It is a curiously eschatological excitement. To anyone like myself who lived through the real ecological disaster of the Dust Bowl in the 1930's and who saw the dust piling up in the streets of Chicago like snow in 1934, it is hard not to have a certain optimism, for certainly the Great Plains are in much better shape today than they were thirty or forty years ago, and indeed, the soils of the United States in general, as a result of the Soil Conservation Service, are probably in better shape than they were in the 1930's. In other parts of the world, of course, the picture is not quite so cheerful, though even here the so-called "Green Revolution" of varieties of wheat and rice with improved yields make things look a little better than they did five years ago.

The possibility of ecological disaster in the future, of course, is not to be discounted. The Southern corn leaf blight epidemic of 1970 in the United States is quite frightening. This caused a loss of 12 per cent in the corn crop in the United States in 1970 and is a reminder of the fact that we are only one or two research years from disaster in many highly specialized agricultures based on monoculture (1). The higher the pressure the greater the disaster when the boiler blows, and there is something about the present situation of mankind which is uncomfortably reminiscent of a pressure cooker.

While it is possible to have a modified optimism about the short-run projects, the long-run problem of the ultimate transition to the "space-ship earth", that is, a technology based on solar energy and the recycling of materials may turn out to be very difficult indeed. It is impossible, however, to make much prognostication of this, simply because what is involved here is the future of human knowledge, and this is something which in its very nature cannot be predicted. To predict what we are going to know in the future is to know it now. Here again, however, there is a great deal to be said for being on the safe side, and one would certainly like to see a substantial research programme initiated in improving the use of solar energy and in the recycling of materials, even at this early date, even though the problem is not likely to become acute for another hundred years.

Questions of very deep moral significance and of enormous difficulty underlie the approach of mankind to a more stationary state. We really do not have any idea how many people a space-ship earth could support. Certainly problems of redistribution and of social conflict become much more acute as we begin to approach a more stationary state. A progressive society, as Adam Smith said, is "cheerful", mainly because it is fairly easy to resolve social conflicts. We can make the poor richer without making the rich poorer, simply by making everybody richer. This is roughly what we have been doing in the United States in the last forty years. There has been very little real re-distribution of income, but the general rise in income has achieved a spectacular reduction in poverty.

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(1) See L.A. Tatum, "The Southern Corn Leaf Blight", Science, March 19, 1971, p. 1113.

In the stationary state, this avenue is not open to us. The only way to make the poor richer is to make the rich poorer. What is even more ominous, the only way the rich can get richer and exercise the power which they have is by making the poor poorer. This opens up possibilities of increased exploitation which the progressive state of the last hundred and fifty years has largely eliminated. It is clear, therefore, that ethical considerations, which in a way can be regarded as a luxury in a developing society, become a necessity in a stationary one. How to translate these ethical considerations into political organization and decision-making, however, is a question that up to now we have very little success in solving in any society, and one can hope that this is mainly because up to now we have not had to solve it.

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# The Christian Ethics of Cost Benefit Analysis

by Denys Munby
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The particular question I want to consider is the relationship between Christian faith and the evolving set of techniques called "cost benefit analysis". Briefly, this is the attempt to quantify all or as much as possible of the data that enter into the assessment of large public projects where the ordinary market mechanism is clearly inadequate. The analysis developed of recent years in relation to water projects in the U.S.A., and is fairly commonly used more or less adequately for the appraisal of road schemes. But it goes much further than this, and can in principle be applied, as can economic theory in general, to any major decision. The more extreme romantic enthusiasts for the subject seem to believe that it will provide a scientific basis for all political and social decisions, just as the Benthamite utilitarians believed that the calculus of happiness would revolutionize politics and eliminate sterile moral disputes. Many of the fundamental philosophical problems are no doubt the same; the difference is that we can now see how in fact choices can be quantified which would formerly have been assumed to be in principle unquantifiable.

Let me give a simple illustration of the sort of thing that is in question. In Britain today there is a commission sitting to discuss the best site for a third London airport, which is in fact carrying out a great deal of research on cost benefit lines. In a small country like Britain there is little space available for the vast areas of sterilized land required by a major airport. Any site is either inconvenient for travellers, or damaging to amenity in terms of noise, destruction of ancient buildings or beauty spots. Attempts are being made (not without considerable success) to quantify many of these factors. I want to concentrate on one which will, I think illustrate the fundamental issues at stake: namely the destruction of natural beauty. Suppose that we have to choose in the last resort between two sites for which we have estimated in money terms all the relevant costs and benefits except the destruction of a beauty spot involved in the choice of one site. Let us suppose that the site that involves no destruction of beauty involves an extra cost to society of £ 50 millions. The question we have to face is whether it is worth spending £ 50 millions to save a beauty spot.

How can we value a beauty spot? At first sight the effort might seem absurd. But it is not in fact so. One preliminary question might be whether it would not be possible to create an equivalent beauty spot elsewhere for less than £ 50 millions. This is after all not so very odd, because much landscape beauty is the result of human efforts and is as man-made as works of art. But let us suppose that in this particular case it is impossible to create a new beauty spot which in any way replaces the original; the original is unique, and if destroyed will be lost to humanity for ever. How then do we value it?

The criterion we are applying is how much money (standing for all other resources, including time - which in cost benefit analysis is itself given a money value) people would be ready to pay to prevent the beauty spot being destroyed. (As we go on, I will try to show both the strength and the weakness in this criterion; it is certainly by no means as silly as it might appear at first sight to the ordinary lover of beauty.) Our first problem

is then to see how we can estimate what any individual would be ready to pay to preserve the beauty spot. One technique is to study how many people visit it, and how much they are prepared to pay to visit it rather than other more accessible places. If someone is ready to travel 300 kilometres and to spend two days of his holiday at the place, we can estimate how much he is ready to pay to see it. If comprehensive data of this kind is collected, we can know not only how much people today are ready to spend on this beauty spot as compared with others, but also what kind of people these are (in terms of relevant characteristics such as incomes, education, whether they live in cities, etc.).

The importance of studying the characteristics of the people who value the beauty spot is because we are not only interested in the present generation, but all future generations who will be deprived of this unique experience if the beauty spot is destroyed. Most major economic decisions affect the future and we have to make our best estimates of the future (uncertain as they are) before we can decide. A few facts about the future we can know with some fair certainty. Thus we know that at any rate for a considerable time ahead incomes and leisure will grow, that more money will be spent on education and people will be better educated, and, most probably, that more people will live in cities. If therefore we find, as one would expect, that beauty spots are valued more by city dwellers and by people with higher incomes, more leisure and better education, and if we can (with modern techniques of regression analysis) estimate the relative importance of these factors in determining the valuation of beauty spots, we can forecast the valuation of this beauty spot by future generations with some degree of conviction. We are in no way bound merely by the valuations of today.

Suppose we have made these calculations to our best judgement (and if we are sensible we will not end up with simple figures, but with a range of figures within which we think our best estimates will lie), how do we compare future generations with the present? The answer is that we have to use a rate of interest - that bridge in all economic calculations between present and future. The rate we use may have nothing to do with actual market rates of interest; what we want is "the social rate of time preference", which reflects society's choice between present and future. To give quite a wide range, economists tend to think this is unlikely to be higher than 15%, and it cannot be lower than zero. Even at about 8%, anything happening more than 30 years in the future has little importance today, unless of course the variables in question are growing at annual rates much in excess of 8% per year (and on the whole incomes, leisure etc. have not commonly grown at these high rates)[1]. This means that unless we choose a social time preference rate which is very small or zero, we do not have to bother very much about what happens in the very distant future, and we can place some reliance on our calculations (in so far as we can rely on any estimates of the future) because we do not have to calculate for a very distant future. My own personal view would tend to prefer a rather low time preference rate for society - which makes our calculations more difficult -, but this is by no means agreed. To see what

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1) At a discount rate of 8%, the present value of £ 100 in 25 years' time is only £ 15; at 15%, £3; at 3%, £ 48 and at 1%, £ 78. Or to put it the other way, £ 15 invested today at 8% compound interest will bring in £ 100 in 25 years' time, and so on.

is involved, let us consider a rate set at zero. This means that we consider the welfare of all future generations equal to our own, in spite of the fact that we know that they will be richer than we are, and in spite of all the hazards and risks that might prevent any of our present-day schemes ever coming to fruition (for example, if atomic war wiped out the human race). It means that we should be ready to spend £ 100 today to produce goods worth £ 100 in for example a hundred years' time. Applied throughout the economic system it would mean a very large diversion of resources into capital goods to produce income for a distant future at the expense of current consumption. The lower the rate of interest, the higher the proportion of income we are ready to give up for the future either by saving or by taxation (in the case of public projects). The fact that people today, in spite of the riches of the rich countries, do not seem ready to cut their consumption beyond a certain point for the benefit of the future, together with the considerations mentioned above, suggests that a zero rate of time preference does not really make sense. Something like 3% might be a figure that most economists would regard as about the lowest reasonable rate to chose. If then we decided that the most sensible rates lie somewhere between 3% and 8%, the problem becomes manageable; the calculations can be made fairly easily and we can estimate how sensitive the results are to the choice of a rate.

Logically, if society wants to make a rational use of its resources it has to use one consistent rate of interest throughout the economy for selecting marginal projects. But, in practice, if for example we found that at 5% the present value of the beauty spot, taking account of the valuations of future generations, came to £ 40 millions, but that at 3% it was worth £ 60 millions, and even if we had confidence otherwise in our figures, we might still prefer to save the beauty spot, though we normally used 5% as our rate of interest. The reason is that, though we are using fairly precise figures, we know that we are not in fact operating in a world of precision.

Is this all that is to be said about the matter? Clearly not. Even those sympathetic to the economist's approach may have doubts. How can money be used to quantify our valuation of beauty? Isn't the very attempt absurd, just another pretension of a rather absurd group of specialists? Wouldn't Newman have had fun at their expense? I do not think this general unease is justified, if we look rather more closely at what we are doing. Firstly, we are not trying to value things in ordinary market price. The whole purpose of the analysis in terms of cost benefit or "shadow-prices" is to get away from the distortions of actual market prices. It would take too long to specify all these, but they relate to such things as monopolistic situations, prices distorted by taxes or government action, exchange rates in disequilibrium, situations where it is impracticable to charge adequately or at all for things people would be ready to pay for (e.g. roads, or public parks), situations where it is impossible (because of "external economies" or "external diseconomies") to make people pay for the benefits or costs they impose on others willy-nilly (smoke nuisance, noise etc.), and indeed any situation where it can be shown that market prices do not reflect real human choices. Cost benefit analysis is the attempt precisely to take account of all the "social costs" that social reformers have (rightly) accused the pure market economists of ignoring. It is an attempt really to measure what is involved in choices - the choices of all relevant people - and how they are affected by other people's actions. Money is merely an abstract measuring rod; there is no other so comprehensive. It is not the use of money symbols that can be criticized, but the actual valuations have to

be examined to see whether they correspond to the way we think things should be valued.

Secondly, in so far as people's valuations depend on their income, the whole exercise depends (as do all economic judgements) on what we think of the actual distribution of income in society. It is in the nature of things that, if society gives some people higher incomes than others, it gives them more weight in society, more command over resources, more power of various kinds. This is unavoidable. Any valuation of any particular use of resources will vary if the distribution of income is different; as we saw earlier, it is likely that valuation of beauty spots will be at least partly dependent on the level of incomes. A social judgement about the distribution of incomes is therefore implicit in any money valuation of resources; it is, however, perfectly possible to make this valuation explicit. Thus one of the points of cost benefit analysis is to specify exactly who benefits and who loses from any decision. People can thus be studied in particular groups, and we can give a different weight to the interests of different groups. Thus if as Christians we did not think the interests of a few millionaires should be judged by their purchasing power, and if we found that only millionaires would be affected by the destruction of beauty spots, we might come to the conclusion that we would not worry very much. What is quite clear is that we can make our analysis as egalitarian as we want. In principle, the whole analysis is entirely democratic; it starts and ends with what people actually want, as shown by their actual choices.

The two previous points do not provide a valid criticism of the criteria used in cost benefit analysis, though they do reveal some of the practical difficulties in its sensible use. The more fundamental difficulty seems to me to arise when one has cleared away these preliminary points. Suppose we have successfully estimated to the best of our capacity the value of the beauty spot to present and future generations, and suppose that we are reasonably satisfied that our estimates are as good as they ever can be in human affairs; I do not want to suggest that in practice cost benefit analysis, which is still really in its infancy, is anywhere near this state as yet, but it is worth trying to look at the fundamental problems which arise. Suppose in the case we have considered, we found that the value of the beauty spot as we have measured it was only £ 20 millions, but that when we looked more closely we found that on the one hand the benefits of the destruction of beauty were very widely spread over large numbers of people and involved only small benefits to any person, whereas the losses of the beauty spot were felt very deeply by only a small number of people in any generation, people whom we judged to be peculiarly sensitive to beauty; what would we say?

If, of course, we happened to believe that people sensitive to beauty should be paid large incomes, the sums would come out all right, as they would be ready to compensate the mass of men for the benefits they would lose by the preservation of the beauty spot. Or if we believed that society should be organized in such a way that power in the state should be given to those sensitive to beauty, they could override the majority by their political power. But we might happen to believe as Christians, as I do, that by and large equality of incomes is a hallmark of a just society, as is also the sharing of power among all people, so that there would be no easy way out of the dilemma. My own conclusion would be that though the majority would have the right to set their own choices against that of the minority, they <u>should</u> not do so. In

other words, though I would fight for the rights of the ordinary man against any pretensions of the learned, the rich, the sensitive, the culture-bearer, the better educated etc., I would equally fight to persuade the majority to respect what are in fact the interests of only a minority, because in this case I believe them to represent something more than the mere interests of a minority.

The case of a beauty spot was chosen to represent a wide range of questions, where it might be thought that ultimate moral issues come into play, as I believe they do. For those who do not think so, one could take other similar issues such as the valuation of life (on which I will make a few remarks later). Christians might want to say that respect for God's creation and the beauty he has created in it is an ultimate which should override the interests of the majority, as indeed we would want to say about murder and human life. The danger of starting at this point is however perhaps clearer from the rough analysis of the particular case I have chosen. If we jump in too soon with our moral judgements, we may ignore such relatively important facts as: how many people really appreciate beauty, what sort of people they are, and how much other people are affected. We might too easily fall into believing that, because it is right to preserve natural beauty, it would be right to support a government which would impose our views on the mass of people; but to believe that a government should do something, and to believe that a government should do this in spite of people not wanting it, are two quite different moral judgements. To believe that beauty should be preserved is not the same as to believe that most people benefit directly or even indirectly from it. To respect the values which can only be appreciated by a small number of people is not the same as to believe that these values benefit most people. It would be nice to believe that what only a few people appreciate benefits the mass of people indirectly. (There is clearly more to be said about this than I have said already.) But I would not be optimistic in the last resort.

I find it difficult to believe that the resources devoted to highly specialized forms of culture and knowledge in civilized societies can be wholly justified by the benefits they bring to the mass of people. I doubt if many of the arcane subjects studied in universities could be so justified; I feel sure that the time may come, and quite likely pretty soon, when the question is raised in a practical way in relation to the resources devoted to the study of theology in universities in countries such as Britain where the bulk of the resources come from the government, and I am not confident that my theological colleagues would be able to justify their existence in terms of the cost benefit criteria we have been discussing!

There are in some sense some ultimates which are related to the love of God and not merely to the love of man, and it seems that they are relevant here, which is why the issues I have raised have, I believe, a theological dimension, though I would rather leave it to those versed in a sensitive moral theology relevant to our times to work out the implications. Some of them may become a little clearer by looking at the economic valuation of human life. Though only the economist has perhaps brought out the issues clearly, implicitly we all do put an economic valuation on human life. We do it by the amount society spends on safety on roads, railways, and aircraft; we do it in medicine by the resources we devote to particular diseases and cures. It is not obvious that these decisions are always rational in the sense that we spend the same

amount to save one life on the roads and on railways. At least we might look at the issue. One method of valuing accidents on the roads in use in Britain measures the loss to society of a death on the roads. The measurement takes account of what society has to pay for damage and hospital care for the victims of road accidents, and then goes on to measure the loss of production resulting from a man's death (deducting from this what the man would consume during his life). And so we come out with the result that the worst loss to society is to kill those who have just finished an expensive education; that it may pay society to kill infants (because the costs to be incurred in their education might not be offset by their future net production); and that it is certainly a positive benefit to kill off the retired. The arithmetic is fine, but what about the criterion? No one really believes in this particular criterion once it is explicitly set out. But we still, in practice, have to give some valuation (in money terms) to human life when we decide whether or not to spend more on road safety, or on hospital care. We cannot in practice escape the arithmetic by general moral judgements. (The only meaning I could give to a statement about the ultimate value of human life in this context would be to say that we should devote all the resources of society above a starvation level of existence to save one human life; but we know that to be absurd, even though it is not absurd to say that a man should give up his life to save another's life.)

The examples I have given have been grossly simplified, and many major issues both of economic analysis and social ethics have been skimmed over. I hope I have not given the impression that cost benefit analysis is a ready-made tool that economists think readily available for solving economic problems. It is rather a challenge to the imagination of decision-makers to think out as clearly and rationally as possible (which means quantitatively) just what it is that they are deciding about. What I have tried to show is that this quantitative approach is as relevant at least to some fields where "ultimate values" are in question as to the more mundane aspects of the economy. What I hope I have shown is that these attempts at quantification bring out more clearly some of the real moral issues at stake.

What is the upshot for Christian social ethics? Firstly, if the Christian faith has to concern itself with people in the situations in which they find themselves, there is no escape from looking at quantities. It is in the quantities that the implicit and explicit valuations are to be found. (Cost benefit analysis is as relevant, if not more so, in developing countries as in the richer countries, because it is well-known that the market mechanism works much less well in these conditions. Whether a rate of interest of 3% or 8% is used may have serious consequences for human welfare; the relative valuation of human life in money terms may importantly affect the limited resources devoted to hospitals and road safety.) If we want to have a relevant social ethics, we have to look at the actual quantities used by the experts and the judgements that are implicit in them. Secondly, theologians should welcome these attempts to clarify decision-making, because, if this clarification is carried out honestly and critically, it will make the moral issues stand out more clearly. Thirdly, warnings are needed. Politicians are only too ready to accept figures from "experts" as proving a case; but the figures are no better than the assumptions on which they are based. Though the whole purpose of cost benefit analysis is to clarify the real issues about which decision-makers have to decide (which means in a democratic society the representatives of the ordinary man), there may be some "experts" who use it to impose their

own valuations on a society which would reject them if they understood what they were.

Finally, we are concerned, as in so much of human life, with decisions between what may seem incommensurables, but which have to be measured. These are matters involving both comfort and culture, bread and suffering, a standard of living and a quality of life, literally both life and death. And we have, inescapably, to treat them "by measure"; how much life? how much death? A sensitive Christian discrimination cannot stand aside. No doubt these things must be looked at case by case. All I want to suggest is that there is here a field for Christian social ethics as important as the actual decisions are to human beings.

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## Two Cultures in the American University

by William J. McGill
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Eleven years ago Charles Percy Snow delivered the Rede Lecture at Cambridge University and touched off a bitter dispute in scientific and literary circles on both sides of the Atlantic. . . .

In 1959 Snow's intentions seemed innocent enough. He titled his lecture "The Two Cultures and the Scientific Revolution", and he sought to explain the growing communication gap between the scientific and literary communities in western society. These communities constituted what amounted to two different cultures, two independent solar systems orbiting around different suns. Neither seemed able to read or understand the other's work. They seldom talked or interacted in other than perfunctory ways. Between them there existed what Snow called "a gulf of mutual incomprehension". Sir Charles regarded this gulf as exceedingly dangerous because British affairs were, he claimed, dominated by the traditional literary culture whereas the future of man was clearly in the hands of the scientists. The literary intellectuals seemed in Snow's thinking to deplore and retard the advance of science. Yet the rapprochement between the Soviet and American super-states was being accomplished through the common understanding of scientists and engineers whose mutual comprehension transcended politics and ideology. Hence the peace of the world was really in the hands of men of science and engineers. The traditional literary culture with its divisive concern for ideology was an obstacle in the path of progress. The situation was, as Snow saw it, somewhat reminiscent of the Industrial Revolution when writers and moralists concentrated on portrayals of grimy towns, gloomy factories, and the exploitation of the poor, failing to see in these hideous beginnings the dawn of a new technological age that would bring abundance and affluence beyond all comprehension.

Much of the early discussion of Snow's essay was essentially a widespread and almost reflex approval of the words of the great British scientist-novelist. Accordingly, there was distinct surprise and chagrin when Snow's arguments were suddenly denounced in the bitterest and most personal terms by F. R. Leavis, a Cambridge don and well-known literary critic who bade his farewell to Cambridge in 1962 with a lecture on "The Significance of C. P. Snow". Later in the same year Mr. Leavis' arguments were developed in more temperate and perhaps more devastating language by Lionel Trilling at Columbia University.

Underlying these criticisms of Snow's conception of the communication gap between literature and science was the view that the central role of good literature is the development of a ripened sensitivity for the human condition and a critical awareness of moral issues. Nothing of this sort played any role in Snow's simple plea for scientific direction in solving the world's

problems. An editorial comment written at the time by the Spectator observed that "the claim of scientists to play a part in government cannot easily be reconciled with the facility which they have shown in shrugging off the consequence of their work. If a writer had worked for the Nazis as the scientists who developed the V2 worked for them, he would have been condemned. He would not have been transported to a position of affluence and authority in the US or USSR. Scientists cannot have it both ways."

Trilling, Leavis and the Spectator leave us with an unmistakeable impression that a world dominated by Sir Charles' vision of triumphant science and technology would be a moral vacuum. If literary men do not somehow retain their polar position of moral consciousness and concern for humanity, we are doomed to an Orwellian future in which all concern for human values is stifled and where literature becomes scarcely more than a propaganda tool in the hands of a technological state. . . .

Today I want to speak again about two cultures in the university. The ideas that Snow and his critics were fumbling with a decade ago are still very much alive and still very important, but our experiences during the eleven years since Sir Charles delivered his now famous essay on two cultures have been quite different from anything he and his critics anticipated. These men saw the future with more discernment than most of us at the time, but the irony of history proved to be a more powerful force than their best efforts to predict the patterns of growth of society.

Snow saw two cultures within the framework of educated men. We now see two cultures forming in the very fabric of our society and they necessarily find their reflections on campus. What relation do they bear to Snow's idea?

This is an era of great divisions in American society. . . .

A ... major factor indicating the special character of the generational phenomenon we are now seeing is an accelerating and almost runaway technological growth. Instant mass communication is one aspect of this growth, but the effects are very widespread and a special set of consequences is operative on young people in colleges and universities. Their education increases year by year in bulk and complexity while all around them society seems to deteriorate into faceless and hostile confrontations. These pressures on young people cannot help but produce reactions and attitudes that increasingly separate our young people from the older and more established elements of society. . . .

It is conceivable that these extraordinary and even frightening divisions are simply the external manifestations of tensions associated with what must certainly be termed one of the most tragic decades in American history. The period between 1960 and 1970 has seen violence, assassination and brutality unparalleled in our recent history. . . . It is possible that the polarised state of our society is a reflection of this upheaval, and that the hostile

confrontations so characteristic of the American scene in the 1960's will begin to disappear when the principal mistakes of the 1960's are rectified, as I pray they will be very soon.

I do not believe that it is going to happen. The old America is gone. Joe College is dead. Youth is in turmoil and the problems of an alienated generation will remain with us for many years to come. The turmoil of our youth is an enduring phenomenon, not a transient consequence of a tragic and frightening decade. The problem is very difficult to analyse. We are in the midst of a national transformation, the scope and depth of which we understand only dimly. We do not have the historian's insight to tell us how to visualise the events we are living through. Like C. P. Snow, we see cultural divisions emerging, but we do not yet know how permanent they are, and we shall not know until the process has developed considerably further. It is very difficult to penetrate the thicket of stereotyped clichés that surround this student generation. Yet like Sir Charles we must stand outside the gulf of mutual incomprehension and attempt to point the directions of the future.

First there is the generation gap. It seems clear that western society is develcping some form of encapsulated youth culture. No-one can live and work on a university campus without seeing and feeling the new cultural milieu. The maintainance of the apparatus of technology is a demanding task requiring both organisation and education on a scale unprecedented in history. When we spoke of automation a few years ago, we knew that it would produce new economic doctrine, new concepts of work and leisure, and new problems involving the aged and the untrained. But one of the major consequences of an automated society is something that none of us anticipated, namely a profound change in the life-styles of young people. More and more time is required for their education.

Whereas only fifty years ago it was expected that a very large majority of young men would enter useful occupations when they were roughly 16 to 18 years of age, and whereas young women were expected to marry them soon after, it is apparent that the demands of a modern technological society require a very different pattern. An increasing segment of the population is being drawn into higher education. We now find it necessary to establish low cost public higher education as an integral part of an advancing technology. In fact we design almost all the incentives for our young people in such a way as to encourage delayed entry into the work force in favor of increased education.

The general effect of this hyper-extended period of higher education has been the build-up of a large group of brilliant and capable young people who are in limbo. They are not children. They are also not yet responsible and productive members of society. They are trainees undergoing a long and arduous apprenticeship with reward only dimly visible and far ahead. Meanwhile society all around them seems to be burning in an orgy of war, violence and corruption.

They wonder why anyone should work for a dimly visible objective inside the system when all around them our social order is decaying. Thus, our universities and colleges seem to be building up a self-contained cultural phenomenon that is in many ways a negative reaction to a scientifically dominated technology. Young people in college want to band together as antagonists of the IBM card. They want to search for new and transcendental experiences with one another. They strive for new honesty in feeling and expression, identifying conventionality as one of the dehumanising effects of a corrupt society. And perhaps most of all they seek new and often simplistic solutions to society's problems, expressing a willingness to make passionate and personal commitments that captures our admiration even as we shake our heads in amazement at the solutions proposed.

The generation gap is not so much a communication barrier between the generations as it is a void between the colleges and the rest of society. We speak of the generation gap in a kind of shorthand to express the divisions in attitudes and life-styles between the adult, well-established segments of American life on the one hand, and the new youth culture on the other. But the leadership and direction for this youthful life-style come largely from colleges and universities. . . .

If you look closely at today's university, you cannot fail to see the growing alienation of the student body. It extends even to the professional schools: architecture, law and medicine. Our campuses are rapidly becoming centres for the development of a youth culture hostile to science and technology. Not all parts of the university, of course, share this hostility. Engineering and science departments and a number of the professional schools are still closely linked to the technology.

Hence, part of the university still serves technological society and attracts the busy and ambitious young people who wish to travel with that society. Another part of the university speaks to the disadvantaged minorities and to the alienated and affluent young whites displaying their rejection in ragged work clothes and speaking in a rough peasant vernacular. This other part of the university does not travel with society. It wants to change us in fundamental ways and with a fierce passion that goes deeper than reason.

It is widely believed that approximately one-third to one-half the undergraduate students on the major American university campuses now fall into this category of the alienated. The development of such a profound social phenomenon in a period of less than ten years has been nothing short of astounding. Some of the alienated are drop-outs from difficult science curricula. Others are young people deeply at odds with the goals and directions of American society. They concentrate in the humanities and social science areas. One of the most remarkable developments of this strange decade has been the drift away from science and the growth of interest and enrollment in humanities and social science. We see that the basic manifestation of two cultures in the

university is not taking the form of an opposition between literature and science as C. P. Snow formulated it. Instead we find a growing gap of mutual incomprehension between the culture of technology and the culture of alienation on campus. This cultural gap is most prominent in our universities but it obviously reflects the larger problems of society and western culture generally. There is almost no doubt that we are passing through a climactic historical period. Historians of the future will look back on this time and describe it in terms analogous to the Renaissance or the Industrial Revolution. We are living in the midst of extraordinary social changes. They are world-wide in scope and closely related to the enormous growth of technological society since the Second World War.

Technological expansion must be paralleled by expanded educational demands on an almost frightening scale. Society becomes increasingly anonymous. As Snow predicted, ideology disappears. Armies of highly trained experts displace individual aspirations and individual initiatives. Technology offers its rational approach to almost every human problem, forcing out politics and indeed almost all forms of personal belief.

Thus the 1960's have witnessed the beginnings of two encapsulated societies, two insulated cultures within our national boundaries mutually at odds, and drifting rapidly apart from one another.

One society is the traditional America. This is the way most people in the world continue to see us and the way most of us like to think of ourselves: busy, energetic, scientific, well-organised, and brusquely efficient. This is the America that has built mass communication ranging from pocket-sized radios to colour television at an unparalleled level of sophistication. It is also the America that builds nuclear ships and monster jet aircraft. It is the America that sends men to the moon and recovers them safely.

The other America is the alien culture of our cities. It is a culture of belief, commitment, and angry protest, based more on the rapture of experiences of liberation than on rational discourse. This America sprang out of the efforts of new racial and ethnic minorities to develop a base of power and authority in our cities. It is a culture dominated by the rage and the vernacular of the inner city ghetto, demanding and peremptory rather than warmly optimistic, violent rather than intellectual, and existing side by side with the traditional America.

One of the most remarkable things about the last ten years has been the way in which the alien culture of the cities has succeeded in capturing the imagination of a significant fraction of our undergraduate college students. They now identify themselves with the dispossessed and the disenfranchised. They seek minority leadership and support minority causes. They see themselves as a humanistic reform movement sweeping aside all the ugliness and inequity that technological society accepts as the price of progress. . . .

I am struck by the students' search for new sensations and transcendental experiences. Experimentation with drugs has become a dangerously important aspect of the campus scene. Although not so widely discussed there is an even deeper need for intense group experience. The bull sessions of a more naïve and simplistic era have given way to group expressions of intense commitment and new explorations with encounter. These activities border on psychotherapeutic experience. There is a conviction among students that such group probing on the edge of unexplored emotional territory produces transcendental feelings of liberation and new conceptions of reality. . . .

I often speculate as to why there seems to be such a profound need for the transcendental liberating experiences of the youth culture. The rock music, the drugs, the intense group process all point to this need. Why is it there? It resembles ancient forms of mysticism and apparently the leaders of the youth culture are singularly impressed by such mysticism. It appears that transcendental experience is especially important as a substitute for causal thinking in the new definition of reality. Automated society is identified with planning, organisation, and cold rationality. If the youth culture rejects these organising principles because they are overly inhibiting, then it follows that irrationality, mysticism, and transcendental experience become symbols of the rejection and vital goals in and of themselves.

I have been trying to describe, clinically rather than moralistically, the manifestations that I am seeing on university campuses: an encapsulated youth culture displaying very considerable mysticism, romanticism. It is almost a secular religion, and because it is a reaction to organisation, it defies organisation. In its view of itself the youth culture is warmly romantic whereas in its view of the university and society at large, it is a culture of angry protest. Frightened segments of the American public which denounce this development as a conspiratorial communist effort can take heart from the thought that the mystical romanticism of our youth would drive any well-trained and disciplined Marxist to utter distraction.

How then do we explain the driving force behind the student protesters? It is no accident that the youth culture exhibits a superficial admiration for Marxism because youth is now so wrapped up in a communal search for amplified sensation and feeling. But the youth culture is also individualistic and romantic. It rejects discipline and authority as creations of an oppressive technological society. Thus its idols are Fidel Castro and Che Guevara. Soviet Marxists have never been able to make sense out of the Cuban revolutionaries, and I am confident that they will never make sense out of the youth culture that began in Britain and America and is now sweeping the world.

College presidents are fond of telling you that protest and disorder on their campuses are restricted to the malign activity of a tiny fraction of the student body who are revolutionaries and who seek to use the campus as a protected base for attacks against society. Most students, or at least the

silent majority, are said to reject such revolutionary activities. They simply want to go to school free from the incursions of these violent extremists. This construction of campus unrest is widely circulated in the press and seems to be accepted at the highest levels of the government. But I cannot stand before you today after the spring we have just experienced in American universities, and working in the shadow of C. P. Snow's brilliant exposition of the two-culture hypothesis; I cannot come before you to mouth such nonsense.

Certainly there are revolutionaries among faculty and students on every major campus in the United States. The terrible decade through which we have lived has produced an equally terrible shattering of illusions about the nature and quality of American life. We have been forced to recognise that much of what our generation believed naïvely about opportunity and progress in America was platitudinous. The war, the violence, the corruption evident at very high levels of business and government, have produced deepening moral concerns. These are conditions that foster the growth of radicalism. Anyone who has had close contact with campus radicals recognises that many of them are idealists, often misdirected, but dominated by ethical concerns that are not always cynically held. Thus at the end of ten years of horror and disillusionment, we find profound forces of radicalisation at work in America and nowhere is this more evident than in the universities.

Revolutionaries are certainly among us and their purposes are certainly hostile to us. It is clearly true that the growth of radicalism during the past decade has increased their numbers. But the newspapers and government officials are probably correct in identifying them as only a tiny fraction of American campus life even in this tortured era. The problem is that these revolutionary groups form a leadership cadre with a singular attraction for a much larger group of alienated students.

The ambience of a modern American university campus is one that is seething with anger and protest. . . . It is clear that the danger associated with student protest is not the relatively few revolutionaries but the considerable strength of the alienation process now permeating the youth culture on all our campuses.

Never was this simple truism more evident than in the sudden upheaval which struck university campuses following the President's announcement of his Cambodian venture and the senseless killings at Kent State and Jackson State. Experienced university administrators were well aware of the scope and force of alienation in generating angry tensions on their campuses. They sought to move flexibly to minimise the audience captivated by the flaming rhetoric of the revolutionaries. Then a sequence of unforeseen and deeply tragic events on a national scale suddenly undid all these skilled professional efforts at building trust. An outpouring of emotion and concern swept the academic year just closing into swift oblivion with an aftermath we are only beginning to assess.

Sir Charles Percy Snow has undoubtedly watched with fascination as American university faculties began to divide during the past spring on the issues of war research and politicalisation of the university. The gulf of mutual incomprehension was certainly there. Scientists were generally on one side of the conflict and the literary intellectuals were on the other. Moreover, the fundamental issue was, as cited by Snow's critics, the moral consciousness of the humanistic community of the university rising up in outrage against the ethical practices of scientists. Much that is ugly was said and continues to be said.

Yet the cultural division is far more real than refined misunderstandings in conversations at the High Table. Society is divided and universities, those sensitive barometers of the turbulent processes of society, are even more deeply divided. The lines of division are not literature versus science in the domination of the university, but technological culture versus the culture of alienation and protest. Faculty members are now being forced to choose up sides and to criticise one another openly.

Representatives of the humanistic disciplines in the main find themselves sympathetic to the yearnings and searchings, and the moralistic strivings of the new youth culture. But not all historians, philosophers and professors of literature or fine arts are so captured.

The new morality on campus is seen by a number of men educated in the liberal traditions of western humanism as being a species of public morality that bears anxious watching. Sometimes, as when they take the form of militant abridgement of the rights of others, these moralistic strivings are frightening and even dangerous. The test of a real university is its ability to maintain a climate of openness and freedom with a genuine respect for the rights of all members of the academic community. Sometimes, as with the searching questions directed by students at officially sanctioned but ethically questionable university practices, these strivings give us hope for important reforms in the moral climate of our relations with government and the military.

On the other side, most scientists responded angrily this spring to accusations of the alienated students that scientists were in effect war criminals for accepting research funds from the Department of Defense. This refined moral consciousness of the youth culture was not matched by an equally refined capacity for understanding the scientists' problems and a willingness to work constructively toward solutions that were not aimed at eliminating science and technology altogether. But not all scientists were simply resentful. Many were profoundly shaken by the shockwave that hit their campuses. They are giving serious thought to ways in which they can modify their research activities and many may even sever their connections with universities.

It is all very remarkable. The reality of our turmoil underscores the trivial character of the decade-old dispute between Snow and his critics. But

the cataclysm that has struck American universities has only deepened a gulf that had been opening for a decade between two cultures in the university, and that, after all, was precisely what Sir Charles was talking about.

I do not know how we are going to repair the damage or alleviate the growing crisis in our universities. Those of us who have committed our lives to the welfare and success of higher education are using every process of repair and conflict-resolution at our command to hold our university communities together in the face of crisis. But it is plain that our own cultural divisions are only superficial manifestations of more fundamental divisions and inner contradictions in society at large as it confronts terrible stresses and near disintegration of a number of vitally important institutions.

We must now be willing to undertake major educational reforms. Somehow we must find a way to educate an alienated youth culture that considers most education irrelevant. We must capture their idealistic desire to help other men and use it to motivate acquisition of intellectual skills necessarily involved in being helpful to others. We must find ways to avoid the characterisation of a formal education as an infinitely regressive period of apprenticeship. Finally we must find ways to rebuild that relation of trust between young people and their government on which the stability of every institution and certainly every university campus ultimately rests.

Whatever contradictions are manifest in our society, there are even deeper contradictions inherent in the philosophy justifying violent protest. It is sometimes claimed that violent protest is the only way to achieve rapid and productive change. Watching the backlash grow in this country suggests that violent protest in an open democratic society threatens the ultimate loss of our freedoms and a terrible, violent repression. This portent cannot be lost on thousands upon thousands of bright young alienated students. They must see that the fate of the violent Student Left is to become the ugliest form of what it seeks to destroy. Our students are watching and learning to fear these violent radicals just as they watched and learned to fear us when we moved into Vietnam.

Let us reach out to one another, accepting the idealism of youth on its own terms, teaching them our own ideals, and work together to become one people again.

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